PATENT APPLICATION

Attorney Docket No. C02046US (98302/1C)

TITLE OF THE INVENTION

"ANTENNA TOWER AND SUPPORT APPARATUS"

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CROSS-REFERENCE TO RELATED APPLICATIONS

U.S. Patent Application No. 09/545,985, filed 10 April 2000 (now U.S. Patent 6,351,250), is incorporated herein by reference.

Priority is claimed to U.S. Patent Application No. 09/545,985, filed 10 April 2000 (now U.S. Patent 6,351,250).

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

Not applicable

REFERENCE TO A "MICROFICHE APPENDIX"

Not applicable

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to tall tower and building arrangements where used for structural and electronic support of antenna. Even more particularly, the present invention relates to an improved antenna tower and support apparatus that features an improved configuration of multiple equipment rooms, multiple sets of antenna cable, and multiple sets of antennae at different elevations on a tower.

2. General Background of the Invention

Very tall towers are typically used to support one or more antennae at desired elevational positions. One of the most common usages of such a tower is in the cellular telephone industry. Other examples of such antenna supporting towers include radio, pagers, television, and two-way radio.

One of the means of defraying the expense of constructing such a tall antenna supporting tower is to provide multiple users with multiple electronic support/equipment rooms. This provision of multiple rooms and multiple sets of antenna associated with a

single tower can present security problems. It is to this problem that the present invention is directed.

Numerous patents have issued that are directed to very tall towers which support either a single antenna or multiple antennae. Examples of such patents are contained in the following table:

Prior Art Patents

Patent #	Title	Issue Date
1,116,111	Station for the Transmission and reception of Electromagnetic Wave Energy	November 1914
3,768,016	Modular, Prefabricated, Integrated Communications Relay Tower	October 1973
4,899,500	CMR Cell Site	February 1990
4,912,893	Transportable CMR Cell Site	April 1990
5,162,807	Architectural Structure Combining At Least One Antenna With Supporting Mast Positioned on the Ground and at Least One High-Power Transmitter	November 1992
5,200,759	Telecommunications Tower Equipment Housing	April 1993
5,581,958	Pole and Cabinet Structure for Antenna-Mounting at Communications Site	December 1996
5,904,004	Integrated Communications Equipment Enclosure and Antenna Tower	May1999
5,969,693	Multi-User Antenna Telecommunication Tower	October 1999

BRIEF SUMMARY OF THE INVENTION

The present invention provides an improved antenna tower and support apparatus that include both structural support for the antenna and its tower as well as telecommunications support via equipment and cabling.

The apparatus includes a foundation which can include piling, if necessary. A building is mounted on the foundation including a plurality of vertically spaced apart

building sections (for example, two or three). The building itself includes a bottom that is next to the foundation and a top that is next to the tower.

A tower is supported upon the top of the building. This support can be in the form of legs of the tower that rest upon the tops of columns provided at intervals around the periphery of the building.

A plurality of antennae are attached to the tower at multiple elevational positions.

Each building section has a security area that is separate from the security area of other building sections.

A plurality of antenna portals are provided, at least one being provided on each building section and preferably communicating with a security area of a building section.

A plurality of antenna cables are provided that extend between the building and the various antennae. Each cable extends preferably from an antenna to a security area of a building via an antenna portal. Each security area has at least one antenna cable that extends to it and each security area has telecommunication equipment that is connected to one of the antenna cables.

The tower can be a self-supporting tower, a guyed tower, or a monopole. The tower can be a guyed tower that is guyed to the top of the building or to the surrounding terrain using appropriate anchors that are embedded in the earth.

At least one of the building sections has multiple antenna cable that enter its security area via an antenna portal.

The multiple antenna can include at least one microwave antenna, one whip antenna and/or one panel antenna. In some installations, the multiple antennae include different types of antennae placed at different elevational positions such as, for example, one microwave antenna and at least one panel antenna placed at different elevational positions.

The apparatus further comprises a single ground ring that is grounded below the earth's surface next to the building. The ground ring is preferably in the form of a ring that extends circumferentially around the foundation of the building, embedded in the earth.

The present invention thus provides an improved building, tower and antenna arrangement that does not require ice bridges, transformer foundations, or electrical

backboard foundations.

The system of the present invention reduces uplift forces at ground level, thus reducing or eliminating the need for deep foundations.

The system of the present invention reduces the required length of tower because of the use of multiple building sections to elevate the lower end portion of the tower.

The system of the present invention reduces construction time and costs for future carriers/users.

The system of the present invention reduces land requirements, fencing, stone or gravel requirements and shortens fall radius of the tower.

BRIEF DESCRIPTION OF THE DRAWINGS

For a further understanding of the nature, objects, and advantages of the present invention, reference should be made to the following detailed description, read in conjunction with the following drawings, wherein like reference numerals denote like elements and wherein:

Figures 1 and 1A are elevation views of the preferred embodiment of the apparatus of the present invention;

Figure 2 is a fragmentary, elevation view of an alternate embodiment of the apparatus of the present invention;

Figure 3 is a fragmentary view of the preferred embodiment of the apparatus of the present invention illustrating the connection between columns associated with different of the various buildings;

Figure 4 is a partial, elevation exploded view illustrating the optional 3 building sections that occupy different elevational positions;

Figure 5 is a schematic plan view of a typical prior art tower and building layout;

Figure 6 is a plan view of the preferred embodiment of the apparatus of the present invention;

Figure 7A-7D are plan views of alternate tower constructions that can be used as part of the apparatus of the present invention;

Figure 8 is a fragmentary view illustrating a floor plan for one of the building section portions of the preferred embodiment of the apparatus of the present invention; and

Figure 9 is another partial plan view of a building section of the preferred embodiment of the apparatus of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

Figures 1, 1A, 6, 7A-7D and 8-9 show the preferred embodiment of the apparatus of the present invention, designated generally by the numeral 10 in Figures 1 and 1A. Antenna tower and support apparatus 10 is shown in its position relative to the earth's surface 11 in Figures 1 and 1A. The antenna tower and support apparatus 10 includes a building foundation 12 that can include a plurality of piling 14 (optional) and a foundation cap 15.

A building ground ring 13 with ground rods 70 (commercially available) is provided near the building foundation 12, as shown in Figures 1A and 6, 7A-7D. Other optional equipment includes fence 16, stairway 21 and balcony 22 with handrails. A lower elevational building section 18 is supported within tower base 17. The tower base 17 is preferably an extension of the foundation cap 15, all of which can be, for example, reinforced concrete.

A plurality of building sections 18, 20, 31 are optionally provided one atop the other. When these three building sections 18, 20, 31 are assembled together, they provide foundation columns 19 connecting the building sections together and can be used for supporting tower 30. Columns 19 transfer load between tower 30 and foundation 12. Tower 30 is preferably a self-supporting tower as shown in Figures 1 and 1A, but can be any of the tower constructions shown in Figures 7A-7D as will be explained more fully hereinafter.

The building sections 18, 20, 31 preferably include a lower elevation building section 18, an upper elevation building section 20, and optionally, a third floor building section 31. In Figures 1-1A, the building sections share a common floor/ceiling. For example, the ceiling for lower section 18 is the floor slab for the upper section 20. Each of the building sections 18, 20, 31 has one or more doors 23, one or more cable access ports 24, as well as one or more HVAC (heating, ventilation, and air conditioning) units 25.

Antenna cable 26 is used to interface each of the building sections 18, 20 and 31 with antennae 64, 66, 68 respectively. The tower 30 can be provided with a hoist 27.

The surrounding earth 11 can provide a stone, asphalt or concrete apron 28, fence 16 and gate 29.

A column support arrangement is provided for defining an interface between the various building sections 18, 20, 31, the building foundation 12, and in some situations, the tower such as self-supporting tower 30. Lower building column 32 is shown in Figures 3 and 4 as being connected (preferably bolted) to a second floor building column 33. In situations wherein three building sections (three floors) are provided, a third floor building column 34 is provided. As shown in Figures 2-4, these building columns 32, 33, 34 can be bolted together using bolted connections 37. However, one piece columns 19 (e.g., Concrete or steel) can be used in place of the column sections 32, 33, 34.

In Figure 2, an alternate construction, designated as 10A is shown wherein the position of the tower 30 is shown in dotted lines, depending upon whether there are two floors or three floors. The tower position is indicated as 35 wherein two building sections (two floors) are provided. The tower position is indicated by the numeral 36 wherein there are three building sections 18, 20, 31 (three floors). In figures 2, 3 column sections 32, 33, 34 are bolted together.

In the plan view of Figure 6, the aligned building columns 19 or 32, 33, 34 are arranged around the periphery of the building that is defined by the three building sections 18, 20 31. In Figure 6, the self supporting triangularly shaped tower 30 is shown for purposes of illustration.

In Figures 7A-7D, other tower arrangements are shown that can be used keeping with the method and apparatus of the present invention. In Figure 7A, a guyed tower 60 is shown supported upon column 59. The columns 59 can be centered but does not have to be. A corner column 19 can be used. Guy wires extend beyond the fence 16 to anchors (not shown) such as for example piling that are driven into the earth for holding the guy wire 61.

In Figure 7B, a self-supporting tower 62 is shown which is similar to the tower 30, but which is rectangular or square in cross section as shown in Figure 7B.

In Figure 7C, a monopole 63 arrangement is provided wherein one or more monopoles 63 sit upon respective columns 59 (only one is shown for purposes of clarity). In Figure 7C, the monopole 63 is self-supporting.

In Figure 7D, a guyed tower is shown similar to the embodiment of Figure 7A. The same column 59 and tower 60 are shown in Figure 7D. The guy wires 61 however, are attached to columns 19, rather than to the earth as with the embodiment of Figure 7A.

Floor plans are shown in Figures 8 and 9 as exemplary for each of the different building sections 18, 20, 31. In Figure 8, four different equipment rooms 41 are shown, each having telecommunications equipment 39 to which is connected an interior cable 38. The interior cable 38 is connected to the exterior antenna cable 26 that travels up the tower (such as tower 30) for connection to the selected antenna 64, 66, 68. Interior walls 40 separate the rooms 41.

In Figure 9, two equipment rooms 42 are shown separated by walls 40.

In Figure 5, an existing, prior art tower and building system is shown, designated generally by the numeral 43. Tower 44 is supported upon a tower foundation 45. A tower ground ring 46 surrounds tower foundation 45. A building ground ring 47 surrounds each building equipment pad 48, 49, 50, 51. In the existing prior art shown in Figure 5, four separate buildings (or equipment cabinets) 52, 53, 54, 55 are supported respectively by separate equipment pads 48, 49, 50, 51. Each of these pads requires its own ground ring 47.

In the prior art example of Figure 5, ice bridges 56 are used to cover cabling that extends from each of the separate buildings or equipment cabinets 52-55 to tower 44. Electrical backboard foundation 57 and transformer pad foundation 58 are also shown in Figure 5.

A third embodiment of the apparatus of the present invention could be provided to provide a building that is of a single level as opposed to the two and three and four level constructions that are discussed above. In the third embodiment, the single building would support the tower such as a self-supporting tower or any of the towers in figures 7A - 7D. However, the single building would provide multiple secured areas such as for example, 2, 4 or 6 rooms separated by permanent walls. In the third embodiment, each secured area (room) has its own antenna portal through the exterior wall of the building, its own antenna cabling, and its own set of antennae at a selected elevational position. In other words, each secured area or room has its own set of antennae at its own elevational position on the common tower.

The following is a list of reference numeral used in the instant application:

LIST OF REFERENCE NUMERALS

Reference Numeral	Description
10	antenna tower and support apparatus
10A	antenna tower and support apparatus
11	earth's surface
12	building foundation
13	building ground ring
14	piling
15	foundation cap
16	fence
17	tower base
18	lower elevation building section
19	column
20	upper elevation building section
21	stairway
22	balcony
23	door
24	cable access port
25	hvac unit
26	antenna cable
27	hoist
28	apron
29	gate
30	three-sided self supporting tower
31	third floor building section
32	lower building column
33	second floor building column
34	third floor building column
35	tower position (two floors)
36	tower position (three floors)

37	bolted connection
38	interior cable
39	telecommunication equipment
40	interior wall
41	equipment room
42	equipment room
43	tower and building system
44	tower
45	tower foundation
46	tower ground ring
47	building ground ring
48	equipment pad
49	equipment pad
50	equipment pad
51	equipment pad
52	building/equipment cabinet
53	building/equipment cabinet
54	building/equipment cabinet
55	building/equipment cabinet
56	ice bridge
57	electrical backboard foundation
58	transformer pad foundation
59	column
60	guy tower
61	guy wire
62	four-sided self supporting tower
63	monopole
64	panel antenna
65	elevational position
66	whip antenna
67	elevational position

68	microwave dish antenna
69	elevational position
70	ground rod

The foregoing embodiments are presented by way of example only; the scope of the present invention is to be limited only by the following claims.

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